Report of Current Tools

A Case Study of the EPA Energy Efficiency Benefits Calculator and the Massachusetts Bill Impact Model.

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John Sibley
Southface
Project Manager
johnsibley3@gmail.com

Dr. Marilyn Brown
Georgia Tech
Principal Investigator
marilyn.brown@pubpolicy.gatech.edu

Alexander Smith
Georgia Tech
Research Assistant
asmith313@gatech.edu

Benjamin Staver
Georgia Tech
Research Assistant
bstaver@gatech.edu

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I. Background

In the states of the Southeast, the expansion of utility-based energy efficiency programs is under active consideration, particularly in the proceedings of public service commissions. Programs in Arkansas, North Carolina, and the Tennessee Valley have been expanding rapidly, achieving savings of as much as 0.7% of annual sales, with 1% in sight.[1] States such as Mississippi and Louisiana have recently adopted rules to begin ramping up with "quick start" programs. Everywhere, the same key questions are being discussed.

- How do the costs of such programs compare to the benefits?
- How does the levelized cost of energy saved compare to the cost of supply side alternatives?
- What is the impact of the expansion of programs on the bills and rates of customers, both participants and non-participants?
- What is the impact of the programs on the earnings and return on equity (ROE) of the utilities?
- What kinds and amounts of compensation to the utilities will assure fair earnings and ROE going forward?
- What societal benefits from the programs can and should be calculated and considered?

Although these key questions remain much the same, the level of information available to stakeholders in these discussions, both advocacy groups and regulators, varies greatly. The tools to address these questions independently are often very expensive or otherwise inaccessible. Enhanced modeling capability, if readily accessible, could provide a more complete picture to regulators and other stakeholders.

A. Project

Southface is working with Dr. Marilyn Brown and the School of Public Policy at Georgia Tech to expand modeling capability to address this policy arena.

1. Goal

The overarching goal of the project is to inform regulatory discussions surrounding energy efficiency programs. As noted above, the inaccessibility of analytical tools currently used to inform such discussions creates an opportunity for improvement through more equitable provision of information. To achieve this end,

[1] See, for example, TVA's annual report on energy efficiency and demand response: http://www.energyright.com/pdf/highlights_2012.pdf

the project will create a new analytical tool with three primary characteristics. The first is that the analytical tool will be relevant to the concerns of stakeholders in the regulatory discussions, including lack of information. The second is that the analytical tool will be accessible to as broad a range of stakeholders as possible. The third is that the analytical tool will remain accurate enough in its analyses to provide information of real value. These three desired characteristics shape both the final tool itself and the process of developing the tool.

2. Process

There are three main parts to the process of developing a new analytical tool to improve regulatory discussions of energy efficiency: review of available tools, consultation with advisors, and synthesis of the new analytical tool.

The review of available tools is necessary to gather lessons from history on what actions to inform stakeholder discussions have already been taken, which have been successful and why, and how to benefit from prior successful efforts. The review of available tools falls into two steps. First is a case study of two prominent tools: the Energy Efficiency Benefits Calculator (EEBC), developed by the US Environmental Protection Agency (EPA) (EPA, 2012); and the Bill Impact Model (BIM), developed by the Department of Public Utilities of Massachusetts (MA-DPU, 2010). A case study of these tools will be useful to the review because both tools are publicly available, transparent in design, and were created to inform regulatory discussions of energy efficiency. This case study will highlight outputs from these two tools that pinpoint energy efficiency impacts and serve as a foundation for discussion of further modeling. The second step is a high-level review of other analytical tools that are less accessible to the general public. This review will reveal ways to represent and analyze impacts of energy efficiency that improve on the two core analytical tools.

Consultation with advisors will aid the development of a new analytical tool by drawing insights from those directly involved in regulatory discussions of energy efficiency. To facilitate advisor consultation, the development involves the formation of an advisory committee. The advisory committee comprises a broad spectrum of stakeholders, including members of Public Service Commissions, representatives of utility companies, members of advocacy groups, and energy industry modeling experts. Roles of the advisory committee members include:

- Vetting model rationale
- Informing questions of data availability
- Informing questions of desired outputs
- Evaluating usefulness of analytical tool

Such a committee will inform and guide the modeling efforts to ensure an informative deliverable.

The synthesis of the new analytical tool will consist of combining elements from other tools and creating new elements that are identified by the review of existing tools and the advisory committee as both valuable and absent from other tools. The parts of current tools that are used and what changes or improvements are made will be informed by discussion with the advisory committee. This discussion will provide the criticism from multiple stakeholder perspectives that is necessary to ensure that the new analytical tool is accessible, accurate, and addresses stakeholder concerns.

B. Models

The two models that have been chosen to serve as a core for discussion and future work are the Energy Efficiency Benefits Calculator (EEBC) and the Bill Impact Model (BIM).

The US Environmental Protection Agency developed the EEBC for the National Action Plan for Energy Efficiency. The EEBC is designed to forecast stakeholder impacts over 10 years, including customer, utility, and societal impacts. The EEBC has since been enhanced and expanded by Lawrence Berkeley National Lab (LBNL), with funding from the US Department of Energy Office of Electricity Delivery and Energy Reliability (DOE OE), and used in state technical assistance efforts that focus on the impacts of energy efficiency and demand response on utility shareholders and ratepayers in response to requests by state public utility commissions or energy offices. The original model is split into two main sections: utility characterization and energy efficiency portfolio characterization. These two sections of data are used to perform an aggregated utility-level analysis of the proposed portfolio.

The Massachusetts Department of Public Utilities developed the BIM to estimate the rate and bill impacts of energy efficiency programs on participants, non-participants, and customers as a whole. While the BIM is designed especially for application to the Massachusetts deregulated market, the principles used in the BIM's analysis can be broadly applied. Specifically, the BIM looks at the bill impact of 3 years of an energy efficiency program rollout. The BIM also examines the impact on rates from the cost of the energy efficiency program, lost recovery of fixed costs, and additional incentives.

II. Process to Date

The first part of the process has been completed and has been reviewed by the advisory committee. This includes collection of appropriate test bed data, review of other available models, and study of the core models.

A. Data Collection

With the goal of the project being to create a broadly accessible tool, data collection was conducted using strictly publicly available information. Georgia Power's current Integrated Resource Plan provided the test bed from which to derive the information. This process began by creating a list of all data required across both models. Once the list was put together, advisor assistance and previous experience guided the search for data sources.

There were three main areas in which data was found:

- PSC docket fillings
- Georgia Power investor information
- EIA Form 861 responses

The PSC filings were spread across a number of dockets identifiable strictly by docket number. The filings used included the 2013 Integrated Resource Plan (IRP) (Georgia Power, 2013), the IRP's Demand-side Management (DSM) application (Georgia Power, 2013), and the Public Utility Regulatory Policies Act (PURPA) Qualified Facilities avoided cost projections (Georgia Power, 2012). Quarterly reports on the DSM program from previous IRPs were available in a separate docket but were not used, except as reference (Georgia Power, 2012).

Georgia Power investor information was drawn from two main documents. The first was from Southern Company's Security and Exchange Commission 10-K filings (Southern Company, 2012). The second document was the Georgia Power annual report (Georgia Power, 2012). Together, these documents were used to characterize the utility.

The Energy Information Administration's form EIA-861 is an annual electric power industry report with information on each utility company in the US (EIA, 2011). The EIA-861 data was used primarily to calculate average rates and to forecast total customers and customer growth.

B. Review of Other Models

There are many other models and much more work that addresses utility funded energy efficiency. A few that are under consideration are:

- Synapse Energy Economics workbook for Nova Scotia
- Energy and Environmental Economics spreadsheet presented at the Georgia Public Service Commission
- ACEEE state EE potential calculator (EEPC)

- Oak Ridge National Lab financial model (ORFIN)
- Ventyx Strategist algorithm
- Integral Analytics DSMore model
- Lawrence Berkeley National Lab Benefits Calculator Model (BC Model)

These models will not receive in-depth treatment; instead, they will be used to address any holes in the analytic power of the core models as identified by advisor feedback.

The Synapse workbook for Nova Scotia was developed by Tim Woolf, who also participated in the development of the BIM, in his former role as commissioner at the Massachusetts Department of Public Utilities. The Nova Scotia workbook represents three more years of thought on the analysis of customer impacts. The nature of the utility in Nova Scotia is also more integrated than a deregulated Massachusetts utility and thus may be a more accurate representation of Southeastern utilities.

The Energy and Environmental Economics spreadsheet, developed by Snuller Price for a workshop at the Georgia Public Service Commission, represents a static levelized cost analysis of the traditional cost-effectiveness tests, such as the rate impact measure (RIM), total resource cost (TRC), and program administrator cost (PAC) tests. The model is not restricted to these outputs alone and includes a range of other impacts without requiring any additional information. This approach could help bridge the gap between analysis of cost-effectiveness and modeling of a broader range of impacts.

The American Council for an Energy-Efficiency Economy (ACEEE) offers a tool called the Energy Efficiency and Pollution Control (EEPC) calculator. The EEPC enables estimation of the costs and pollution-reduction benefits of multiple energy efficiency measures and pollution control measures deployed in a combination specified by the user for a state selected by the user (Hayes & Young, 2013). The visual interface of the EEPC is especially user-friendly, and the emphasis upon pollution offers insight on presenting societal benefits to regulatory discussions.

The Oak Ridge National Lab Financial Model (ORFIN), developed by Stan Hadley, is a financial and production simulator for electric utilities. It was originally created to address the push to deregulate energy markets, but the pricing and financial analysis, as well as the economic dispatch model, could serve to inform the workings of a future model (Hadley, 1996).

The Strategist tool from Ventyx is a utility resource planning application commonly used by utilities in the southeast (Ventyx, 2013). Strategist accepts a demand forecast as input and performs an optimization of capital investments and plant dispatch in order to meet that demand forecast. Strategist reflects a level of accuracy accepted by stakeholders and a familiarity with it will help to make sure the final tool is accurate and generalizable across the Southeast.

The DSMore tool from Integral Analytics has the power to analyze energy efficiency impacts at highly refined temporal and spatial resolutions (Integral Analytics, 2011). DSMore and the Ventyx Strategist algorithm are often used in tandem. DSMore's analytic engine directly links DSM load savings and demand response to historic hourly weather and forecasts of prices and avoided costs. This ensures an accurate quantification of the covariance between prices and loads, which improves the representation of DSM and Smart Grid programs targeting peak loads and prices. DSMore contains hourly load savings for each measure linked to weather history, creating thousands of hourly and weather-specific load savings shapes. These load savings shapes increase the accuracy of the avoided cost results. While the level of detail of the analysis yields greater accuracy, it puts the tool beyond the reach of some users. Integral Analytics links DSMore to several other tools that perform spatial forecasting of demand and dispatch optimization. These other tools help DSM planners target energy efficiency measures to high-cost locations and high-cost hours of demand.

Lawrence Berkeley National Laboratory (LBNL) has enhanced and expanded the EEBC with many additional features and has used its BC Model in technical assistance to several states interested in understanding the impacts of energy efficiency and demand response on utility shareholders and ratepayers (e.g., Kansas, Arizona, Nevada, Massachusetts, and Illinois) as well as in regional regulatory policy exercises sponsored by the State Energy Efficiency Action Network Working Group on Driving Ratepayer-funded Efficiency through Regulatory Policies.[2] LBNL has added capabilities for modeling a greater variety of shareholder incentive mechanisms and lost fixed cost recovery mechanisms (e.g., revenue-per-customer decoupling), energy efficiency program savings and costs, and changes to utility costs based on the ability of energy efficiency to defer or avoid incremental capital investments (e.g., new generating plants) (LBNL, 2009). The BC Model was further updated by Lawrence Berkeley National Lab to include the ability to model demand response programs (Satchwell, Cappers, & Goldman, 2011).

The following section provides an evaluation of these tools according to our goals of relevance to stakeholder concerns, maximizing accessibility, and maintaining accuracy.

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[2] See Kansas Corporation Commission, "Final Order in the matter of general investigation regarding cost recovery and incentives for energy efficiency programs," Docket No. 08 –GIMX-441-GIV," Nov. 2008; and Arizona Corporation Commission, Final ACC Policy Statement Regarding Utility Disincentives to Energy Efficiency and Decoupled Rate Structures, Docket Nos. E00000J-08-0314, December 29, 2010. See also SEE Action Network http://www1.eere.energy.gov/seeaction/rpe.html

Evaluations of other tools

We evaluated several of the tools listed above according to criteria used to operationalize the goals we set forth for this study. These criteria were developed on the basis of specific components of each goal that we have discovered over the initial course of this project. We present our evaluations in three separate tables: first, a table evaluating the reviewed tools' relevance to stakeholder concerns is presented; second, a table evaluating tools' accessibility is presented; and third, a table presenting the tools' accuracy is presented.

Some of the tools listed above are not included in this evaluation. Specifically, ORNL's ORFIN, Ventyx's Strategist, and LBNL's updates to the EEBC are not included in this evaluation for the following reasons. ORFIN was determined to lie outside of the domain of interest for the reviewed tools, as it is designed to model impacts of restructuring and not specifically impacts from energy efficiency. Similarly, Strategist was found to lie outside of our project's domain. Strategist performs extremely detailed calculations for making capacity investment and dispatch choices, but Strategist is not capable of treating energy efficiency in any level of detail because it accounts for all demand-side management impacts, including distributed generation, as a reduction in the demand forecast. Strategist does not perform any calculations to develop or otherwise alter that forecast, and therefore does not treat energy efficiency in a level of detail that is relevant to the stakeholder concerns we have discovered in this project.

Relevance to Stakeholder Concerns

We begin the evaluation with a discussion of our criteria for evaluating the tools' abilities to address stakeholder concerns. From consultation with the advisory committee, review of the existing models, and our case study of the EEBC and BIM, we determined three major areas of stakeholder concern relevant to regulatory discussions of utility energy efficiency programs (in no order): (1) societal impacts, (2) customer impacts, and (3) utility impacts.

The broad categories of stakeholder concern were operationalized into outputs that we discovered as being important to each category. Within the category of societal impacts, we found there was great concern with three possible outputs from any analytical tool: (1) emissions levels, (2) avoided costs of investment and generation, and (3) reductions in retail electricity prices across customer classes, the last of which is called the demand-reduction-induced price effect (DRIPE). We found that outputs characterizing bills and rates, as well as outputs identifying the difference in impact between energy efficiency program participants and non-participants, were important to addressing concerns with customer impacts. Finally, concerns related to utility impacts were found to be embodied within outputs of the utility's earnings and return on equity (ROE).

Appendix D displays our evaluation of the reviewed tools against these criteria of outputs. Tools are evaluated on the basis of the quality with which they deliver the outputs of interest. A key to the table appears in the lower rows, showing how the quality of each output was coded – from highest quality"++" to lowest quality "--", where outputs that were altogether missing were represented with "\".

In evaluating the models, we found that the customer impacts area is well-represented, utility impacts have an intermediate quality of representation, and societal impacts are underrepresented. The underrepresentation of societal impacts may reflect two observations made by some members of the advisory committee. First, the advisory committee has observed that regulatory hearings on energy efficiency tend to be unconcerned with the emissions impacts of energy efficiency. Second, the advisory committee has observed that, while avoided cost outputs are of major interest in regulatory hearings, they are difficult to calculate and difficult to generalize across territories. These factors may compel designers of analytical tools to omit emissions impacts and avoided cost calculations. While we will likely be able to borrow elements and ideas from these other tools for representing customer impacts and utility financial impacts, we will need to be more creative and resourceful in developing any societal impacts calculations within the new analytical tool.

Accessibility

The analysis of the other tools with respect to accessibility follows a form similar to that done for stakeholder concerns. For the area of accessibility, we found three broad areas of concern – public availability of the model itself, public availability of the data used to populate the model, and the generalizability of the model to multiple states and utility service territories. These areas were further specified as the extent to which the models were available and transparent in their calculations; the public availability of the data for characterizing the utility and the energy efficiency program, separately; and how generalizable were the calculations related to the utility; and how generalizable were assumptions about regulations and incentives in each of the models. The evaluation of the tools with respect to these characteristics appears in Appendix D.

Overall, we find that most of the tools reviewed were available at low cost, transparent in their calculations, and used public data for the utility and energy efficiency program. The Integral Analytics Suite ranked lowest in this evaluation due to its proprietary nature and the advanced, proprietary datasets of which the Suite makes use. The field of tools was somewhat weak in their generalizability; only EEBC, EEPC, and Integral Analytics Suite were applicable to multiple states and utility service territories, while BIM, Nova Scotia, and Energy and Environmental Economics tool relied heavily upon assumptions and calculations for a specific utility service territory. All the models provide good examples of how to use public data and illustrate that public accessibility to the model itself is both important and possible. On the issue of generalizability, development of the new tool should pay special attention to the advantages of specifying the tool, as well as how generalizability across service territories is achieved.

Accuracy

Following the analyses for accessibility and relevance, the analysis for accuracy was divided into broad areas of aggregation, scale, dynamics, and cost recovery modeling. These areas were largely defined by guidance received from the advisory committee; while there are many areas important to the accuracy of a tool for analyzing utility energy efficiency, the advisory group felt that the areas listed here were of especial importance and merited focus for the development of a new tool.

The areas of accuracy were sub-divided into the time resolution of each model; the level of aggregation of customers, programs, and measures in each model; the duration of each model's forecast period, and the period over which the model assumes energy efficiency programs will be deployed; the ability of each model to handle a mix of programs and measures that will change as a result of interactions with external policies and economic trends; and each model's ability to accurately portray recovery of the costs of energy efficiency and the costs of supplying electricity.

Overall, we found that there were several weak areas within accuracy among the reviewed models. None of the models were able to handle a changing mix of measures. While the Integral Analytics Suite and RMI's EDGE model scored highly on other accuracy criteria, most models were lacking. The area of greatest strength for the models seemed to be the analysis duration, where most models used a long time horizon (over ten years). From this section of the review, we can conclude that there are many areas to improve on the current field of models with regards to accuracy. This section of the review may also provide a cautionary tale about the tradeoffs between accuracy and accessibility, however, as many of the models that scored low on accuracy also scored high on accessibility.

C. Possible Analysis Results

Report of Current Tools

Based on study of the two core models, preliminary review of other models and discussions with advisors, the outputs listed below appear to be most important for informing the issues identified at the beginning of this report.

1. A measure of the costs of the programs for purposes of comparison to supply side alternatives, presented as levelized cost per kWh of energy saved or other measure of the cost of saved energy. This information is not a direct output of either EEBC or BIM.

2. A comparison of benefits to costs of the programs, based on the tests described in the California Standard Practice Manual: Participant Test, Ratepayer Impact Measure Test, Total Resource Cost Test (with the variant known as the Societal Cost Test), and Program Administrator Cost Test (also known as the Utility Cost Test). These results are also not a direct output of either of the core models.

3. A description of the impacts of the energy efficiency investments on the utility, particularly the impacts on earnings and Return on Equity. EEBC addresses these impacts, but BIM does not. The outputs of the EEBC allow assessment of the impacts on earnings and ROE of various approaches to compensation of the utility for the investments in energy efficiency.

4. A description of the impacts of the programs on customers, particularly the impacts on their bills and on their rates. Both EEBC and BIM address bill and rate impacts. Both can show the trajectory of the impact year by year, as well as the total impact over time, and can compare the impact of expanded energy efficiency programs to a base case. BIM provides greater granularity than EEBC, which only calculates the impacts for all customers. BIM shows impacts by customer class and can assess how impacts differ between participants in programs and non-participants.

5. A measure of societal impacts, generally limited to emissions reductions in the models. EEBC addresses these impacts, but BIM does not. Societal impacts also include impacts to TRC costs of capital investments made by the utility.

III. Case Study

Findings from the study of the EEBC and BIM fall into two different categories: observations of their inputs and the model outputs.

A. Input Observations

The inputs required from the two models fall into broadly different categories. The EEBC characterizes the utility with data from a variety of sources, including public financial reports, and characterizes the energy efficiency portfolio with Public Service Commission (PSC) filings. Conversely, the BIM uses data almost exclusively from PSC filings. All inputs for both models can be seen for the 2013 Georgia Power Integrated Resource Plan (IRP) in Appendix A. The following paragraphs discuss the pros and cons of the inputs for the EEBC and the BIM in turn.

EEBC Inputs

The inputs for the EEBC consist of utility-characterization variables, including financial variables such as debt percentage, depreciation rates, and state and local tax rates; production cost variables such as marginal costs and costs of purchased capacity; and rates, load factor, and peak load. Data for satisfying many of these variables is available in standard annual financial reports filed by the utility company. The EEBC also makes use of calculated or judged variables, such as the percent of capital expenditure that is growth related and various growth forecasts. Some of these abstract variables may be estimated from historical financial documents filed by the utility, but others must be satisfied by user judgment. The percentage of capital expenditures that is growth related is a variable for which public data are not readily available, for example, and requires expert judgment to satisfy.

These judgment-driven variables make characterization challenging for the EEBC and may exclude some stakeholders, particularly non-experts. Use of such variables could be improved if some guidance was given on what judgments are reasonable and on what information those judgments should be based. To resolve issues surrounding judgment-driven variables, the project team resorted to a combination of expert elicitation with the advisory committee and referring to previous instances of the model usage, steps that may not be feasible for future users.

Labeling is an issue with some of the EEBC inputs. To new users, it is not clear why the model would ask for “average cost of purchased power” and “generation capacity cost if purchased” separately. Also, the variable labeled “generation capacity cost if purchased” appears to be used as an estimate of both cost of purchased capacity and cost of capacity owned by the utility. The labeling in the EEBC is not always consistent with the terminology used in utility financial filings and PSC documents. As such, it would be helpful to have some documentation that informs users of what labels might be used in utility documents for the data that is appropriate for each EEBC variable. Also helpful would be documentation that guides users on what variables in utility documents may be substituted for EEBC variables. For example, we were advised that we could use the avoided costs calculated for PURPA qualified facilities as substitutes for peak and off-peak marginal costs of generation. Indications of what other, similar data substitutions are reasonable would help adapt the EEBC to variations in utility data reporting practices.

A convenient feature of the EEBC inputs is the allowance for other capital expenditure projects to be recorded in the utility characterization, which could be usefully adapted toward a model of other utility programs like advanced metering infrastructure roll-outs. Also, the EEBC gives users the option to enter custom technologies and their emissions patterns for analysis of emissions impacts of EE. The EEBC does a great job of simplifying the emissions analysis for users by including example technologies such as natural gas or oil turbines and coal for base load.

BIM Inputs

The Public Service Commission filings data used by the BIM is based on analyses conducted by the utility. The variables for which data are produced from such analyses include customer and participant counts, program budget, savings, and avoided cost estimates.

The BIM avoids many of the characterization issues of the EEBC by simply not characterizing the utility as a whole and focusing on the customer impacts, which reduces the number of inputs necessary. The BIM also simplifies inputs and avoids the need for growth rates by only considering the three years of program lock-in between the time of the current IRP and the next; hence, inputs used to characterize sales and the EE program require at most three years' worth of annual inputs. The choice to model only the period of energy efficiency program that is locked in during the IRP hearing, instead of the full 10-year program being proposed, has caused confusion.

The BIM requires a variety of publically filed data and user judgments, which it uses as proxies for more abstract variables. An example of concrete data used by the BIM is PURPA avoided cost values. The BIM uses the growth of avoided costs values as a proxy for the growth of rates. While this is not precisely accurate, being off by roughly 10-30% out five years, it helps provide a ballpark figure without leaving stakeholders stranded that lack the experience to determine expert judgment variables. Conversely, the BIM also requires savings load shapes, about which the user must make judgments based on program composition. Most BIM inputs are concrete, however, making them easy to draw from utility PSC filings, which subsequently improves the accessibility of the BIM.

The input for the BIM that is most challenging is the number of participants in energy efficiency programs. This variable poses a challenge in a number of ways, including the conversion from number of measures to number of participants and determining overlap across programs. This was resolved by the project team through expert judgment from the advisory committee to approximate rates of overlap within and across programs. Apart from participant numbers, the most difficult aspect for the BIM was finding the correct docket number to find the available data. A clear list of all dockets was not available so each number had to be found independently, an issue for both models.

B. Output Observations

The outputs too are different between the two models, examples of which can be seen for the 2013 Georgia Power IRP in Appendix B. Both models show information on bill and rate impacts. The BIM, however, shows more detailed rate impacts and differentiates between participant, non-participant, and total bill impacts. The EEBC on the other hand describes EE over a ten-year forecast period from a variety of perspectives: customer bill and rate impacts, utility financial impacts, and societal benefits. The following paragraphs describe the pros and cons for the EEBC outputs and the BIM outputs in turn.

EEBC Outputs

The EEBC provides EE impacts upon average customer bills as percent changes and EE impacts upon rates in absolute terms. The EEBC reports the average bill impact and does not distinguish between EE participants and non-participants in its analysis of bill impacts.

The utility financial impacts that the EEBC shows are a calculation of the utility's return on equity and total earnings over a ten-year forecast period. As the only financial impacts calculated by either model, they supply valuable information. The EEBC does not, however, take into account energy efficiency programs previously planned; neither model accounts for it. The reduction in ROE and earnings is accurate if the entire energy efficiency proposal is new. This is not the case in Georgia as the last 10-year plan for energy efficiency was accounted for in the previous PSC rate case. Due to this, only the change in size or scale of the program from the 10-year plan considered in the rate case would affect earnings and ROE. In terms of calculating the actual rate faced by customers the same should be considered to prevent double counting energy efficiency program impacts on rates.

The emissions impact of energy efficiency is an output of the EEBC. This is calculated based on the technology selected for peak and base load technology being offset. The EEBC provides emissions impacts results for NOx, SOx, CO, VOC, PM-10, and CO_2.

BIM Outputs

The BIM model, as the name would suggest, goes into detail on bill impacts and rate impacts but does not discuss impacts at the utility or societal scale. It excels in the level of detail and fullness of the story for customers. It shows the change in bills broken down by participants, non-participants, and all customers. The workbook even includes the long-term levelized bill impact for each of these groups.

Along with breaking down the bill impact by group, the BIM breaks down the rate impacts by different factors such as the program cost and lost fixed cost recovery. The impact on rates and overall program cost, however, is the area with most Massachusetts-specific details in the analysis, e.g. Regional Greenhouse Gas Initiative (RGGI) funding and low-income Energy Efficiency Reconciliation Factor (EERF). These were not applicable in the case of Georgia and were left blank. Some of the analysis details still applied but under slightly different names and were repurposed in representing the test bed. The way BIM handles calculation of the base rate is an area that may be more detailed than necessary. This may be in part due to the deregulated nature of the energy market in Massachusetts, with delivery and supply rates being handled separately.

The outputs from the BIM are given separately for different rate classes. Classes include general residential, commercial, and small commercial. This was not due to the structure of the model, per se, but was based on the convention for entering data. Different instances of the BIM had to be created to handle each class independently, and such a breakdown could be applied to the EEBC also. This was an intended use of the BIM and was thus implemented in our review of the models.

However, the method used does not account for cross-class impacts from EE programs. Cross-class impacts would include the change in recovery of fixed cost as well as changes in fuel cost due to reduced demand. The BIM has the capability to include calculations of transmission and distribution avoided costs and DRIPE, but the data was not available for GA Power to fully consider them. T&D at least is already bundled into the PURPA avoided cost calculation in Georgia but would have to be considered separately for other areas in the Southeast.

A key issue highlighted by an advisory committee member is that neither the BIM nor the EEBC is capable of accounting for the impacts of energy efficiency upon rates, beyond the increase in rates necessary to cover costs of subsidy to EE measures and the costs of administering the EE program. Electricity rates and their subsequent components are driven by load forecasts, and the load forecasts are impacted by energy efficiency. A large reduction in forecast load from energy efficiency would significantly increase the fixed cost recovery component of electricity rates, for example. The utility would have fewer sales from which to recover its fixed costs, so a greater rate would be necessary to bring in revenues sufficient for fixed cost recovery. Without the ability to treat this effect upon rates and perform a dynamic load forecast, the accuracy of the models' results is in some doubt.

IV. Advisor Feedback

Feedback from advisors during the first phase of the project falls into two main categories. The first is on the model outputs and the impacts of energy efficiency they represent. This would include commentary on the usefulness of outputs from the core models and other outputs to pursue to fully capture the important impacts of energy efficiency programs. Internalizing the key impacts identified by the advisors is what the new model is aimed to achieve.

The second feedback category is items of concern for analysis. These are features of current tools that should be avoided in the synthesizing the new tool.

A. Key Impacts

So far we have heard feedback on three areas of impact: societal benefits, customer impacts, and utility impacts of energy efficiency. The quantification of societal benefits has been identified as valuable, and various metrics have been discussed. The emissions impact of energy efficiency has been deemed important, particularly with regard to how different compositions of measures in a portfolio would change impacts upon emissions.

Another dimension of societal impacts that has been discussed is the issue of free riders and free drivers. How to account for behaviors that would have happened naturally without an additional incentive, as well as behaviors that go beyond the level incentivized, is a challenge in any policy discussion. Advisors have highlighted this challenge as one that would be valuable to address for the discussion of utility energy efficiency.

Many different cost-benefit tests are widely used to assess energy efficiency. Including these tests could serve a dual purpose of further integrating them into regulatory discussions and calibrating the accuracy of the new analytical tool. These tests address not only overall benefits but also the impact of energy efficiency on various classes of customers, another area identified by advisors as important.

A final aspect of societal impacts has been identified as cross-class effects of energy efficiency programs. These are primarily customer impacts that extend beyond the customer class that is implementing the energy efficiency measures.

Specifically, certain rate changes between the base case and efficiency case have been highlighted such as fuel cost recovery and fixed cost recovery. Transmission and distribution savings are another cross-class benefit of EE programs.

Customer impacts come in a number of forms. One that is frequently identified as important is rate pressure. Public service commissions have highlighted the importance of considering any upward rate pressure, including rate pressure driven by investment in energy efficiency. Rate pressure can be interpreted as a sign of the monopoly putting undue pressure on their customers.

Rate impacts do not, however, tell the full story of energy efficiency programs. Even under higher rates, consumption reductions could still lower costs to consumers through bill reductions. This highlights the importance of bill impacts as well as rate impacts. However, an overview of average bill impacts has been identified as insufficient. Advisors have specified that information on the impacts for participants in contrast to the impacts for non-participants is a valuable level of detail for policy discussion.

One area of utility impact that was brought up specifically was incentive mechanisms. These vary widely across the US and Southeast and, as such, all the varieties will need to be captured. More than simply capturing the implemented mechanisms, advisors expressed interest in comparing the impacts of differing incentive mechanisms to understand the result for the utility and customers.

Finally, information on the impact of energy efficiency programs on utilities has been observed as important. Discussion on including benefits beyond just the avoided cost of production has occurred but few details have been established. Further advisor feedback and other tools could serve to outline the impacts on utilities, both beneficial and otherwise, of energy efficiency programs.

B. Analytic Concerns

As well as discussing the key impacts to address with any analytical tool, advisors have given feedback on concerns with current, past, and future analyses. One area of concern is the granularity of analysis, which appears to be important in a number of ways. The largest issue of granularity relates to time-scale, specifically with regards to the time horizon for the energy efficiency program that that should be used in the analysis. Some analyses take into account the full duration of a proposed program, while others only address the period of “program lock-in” for a PSC hearing. Addressing the full duration of a proposed program seemed the most accessible and readily understandable approach. Discussion also arose on the length of the time horizon over which the impacts of a program should be considered. Expert advice suggests a 25 year period will account for the full impact of a 10 year proposal with a 26th year to catch all ‘henceforth’ impacts.

A question of time-scale was brought up in another regard: can the full impacts of an energy efficiency program be analyzed at an annual scale? Requiring inputs at a greater scale could make the model inaccessible but more accurate. Reviewing methods to account for impacts down to an hourly level while not requiring that level of detail in inputs was suggested.

Another dimension of granularity was proposed to help in this regard. The factor suggested was the level of aggregation from which to approach an energy efficiency proposal. Some analyses have been conducted with the full portfolio, while others break the proposal down by general rate classes. None, however, have addressed the make-up of programs within a proposal. Advisors expressed that such a level of refinement could supply more accurate information on the impacts of energy efficiency by accounting for the impact of different end uses.

Aside from the discussion of granularity, advisors raised concerns about the temporal dynamics of analysis tools. Specifically, discussion arose surrounding change in program composition over time. Changing composition of program measures could change the expected benefits from a proposal. Changing lifetime of measures, either from shifting composition of a program or changing technology, could also change proposal benefits. Both would require changes in the dynamics of analysis to fully capture their impacts.

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